

C L A I M S:

1. A hard precious metal alloy member consisting essentially of a gold alloy, which has a gold Au content of from 37.50 to 98.45 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm.

2. The hard precious metal alloy member according to claim 1, consisting essentially of a gold alloy, which has a gold Au content of from 37.50 to 98.45 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total.

3. The hard precious metal alloy member according to claim 1, wherein the member consisting essentially of a cast alloy, and has a hardness of not less than 130 Hv, and a Young's modulus of 6,000 kg/mm².

4. The hard precious metal alloy member according to claim 1, wherein the member consisting essentially of a worked alloy at a working rate of not less than 50%, and has a hardness of not less than 150 Hv, and a Young's modulus of 6,000 kg/mm².

5. The hard precious metal alloy member according to claim 2, wherein Ca is selected from the alkaline-earth elements.

6. A hard precious metal alloy member consisting essentially of a platinum alloy, which has a platinum Pt content of not less than 85.0 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm.

7. A hard precious metal alloy member according to claim 6, consisting essentially of a platinum alloy, which has a platinum Pt content of not less than 85.0 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total.

8. The hard precious metal alloy member according to claim 7, wherein the member consists essentially of a cast alloy, and has a hardness of not less than 120 Hv, and a Young's modulus of not less than 8,000 kg/mm².

9. The hard precious metal alloy member according to claim 7, wherein the member consists essentially of a worked

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alloy at a working rate of not less than 50%, and has a hardness of not less than 150 Hv, and a Young's modulus of not less than 8,000 kg/mm².

10. The hard precious metal alloy member according to claim 7, wherein Ca is selected from the alkaline-earth elements.

11. A hard precious metal alloy member consisting essentially of a silver alloy, which has a silver Ag content of not less than 80.0 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm.

12. A hard precious metal alloy member according to claim 11, consisting essentially of a silver alloy, which has a silver Ag content of not less than 80.0 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total.

13. The hard precious metal alloy member according to claim 11, wherein the member consists essentially of a cast alloy, and has a hardness of not less than 130 Hv, and a Young's modulus of 7,000 kg/mm².

15. The hard precious metal alloy member according to claim 12, wherein Ca is selected from the alkaline-earth elements.

16. A hard precious metal alloy member formed of a precious metal alloy, which consists essentially of two or more elements selected from the precious metal element group consisting of gold Au, silver Ag, platinum Pt, palladium Pd, rhodium Rh, ruthenium Ru, and osmium Os, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm.

17. A hard precious metal alloy member formed of a precious metal alloy according to claim 16, which consists essentially of two or more elements selected from the precious metal element group consisting of gold Au, silver Ag, platinum Pt, palladium Pd, rhodium Rh, ruthenium Ru, and osmium Os, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B,

in a range of not less than 50 ppm but less than 15,000 ppm in total.

18. The hard precious metal alloy member according to claim 16, wherein the member consists essentially of a cast alloy, and has a hardness of not less than 130 Hv, and a Young's modulus of 7,000 kg/mm².

19. The hard precious metal alloy member according to claim 16, wherein the member consists essentially of a worked alloy at a working rate of not less than 50%, and has a hardness of not less than 150 Hv, and a Young's modulus of 7,000 kg/mm².

20. The hard precious metal alloy member according to claim 17, wherein Ca is selected from the alkaline-earth elements.

21. A hard precious metal alloy member formed of a precious metal alloy, which consists essentially of at least one element selected from the group consisting of gold Au, silver Ag, platinum Pt, palladium Pd, rhodium Rh, ruthenium Ru, and osmium Os, and at least one element selected from the group consisting of copper Cu, nickel Ni, aluminum Al, zinc Zn, and Fe, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm.

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22. A hard precious metal alloy member formed of a precious metal alloy according to claim 21, which consists essentially of at least one element selected from the group consisting of gold Au, silver Ag, platinum Pt, palladium Pd, rhodium Rh, ruthenium Ru, and osmium Os, and at least one element selected from the group consisting of copper Cu, nickel Ni, aluminum Al, zinc Zn, and Fe, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total.

23. The hard precious metal alloy member according to claim 21, wherein the member consists essentially of a cast alloy, and has a hardness of not less than 130 Hv, and a Young's modulus of 7,000 kg/mm².

24. The hard precious metal alloy member according to claim 21, wherein the member consists essentially of a worked alloy at a working rate of not less than 50%, and has a hardness of not less than 150 Hv, and a Young's modulus of 7,000 kg/mm².

25. The hard precious metal alloy member according to claim 22, wherein Ca is selected from the alkaline-earth

elements.

26. A hard precious metal alloy member consisting essentially of a platinum alloy, which has a platinum Pt content of not less than 99.45 wt%, and contains gadolinium Gd in a range of not less than 50 ppm. but less than 5,000 ppm.

27. A hard precious metal alloy member according to claim 26, consisting essentially of a platinum alloy, which has a platinum Pt content of not less than 99.45 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 5,000 ppm in total.

28. The hard precious metal alloy member according to claim 26, wherein the member consists essentially of a cast alloy, and has a hardness of not less than 120 Hv, and a Young's modulus of not less than 8,000 kg/mm².

29. The hard precious metal alloy member according to claim 26, wherein the member consists essentially of a worked alloy at a working rate of not less than 50%, and has a hardness of not less than 150 Hv, and a Young's modulus of not less than 8,000 kg/mm².

30. The hard precious metal alloy member according to claim 27, wherein Ca is selected from the alkaline-earth elements.

31. A hard precious metal alloy member consisting essentially of a palladium alloy, which has a palladium Pd content of not less than 99.45 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 5,000 ppm.

32. A hard precious metal alloy member according to claim 31, consisting essentially of a palladium alloy, which has a palladium Pd content of not less than 99.45 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 5,000 ppm in total.

33. The hard precious metal alloy member according to claim 31, wherein the member consists essentially of a cast alloy, and has a hardness of not less than 120 Hv, and a Young's modulus of not less than 7,000 kg/mm².

34. The hard precious metal alloy member according to claim 31, wherein the member consists essentially of a worked alloy at a working rate of not less than 50%, and has a

hardness of not less than 140 Hv, and a Young's modulus of not less than 7,000 kg/mm².

35. The hard precious metal alloy member according to claim 31, wherein Ca is selected from the alkaline-earth elements.

36. A hard precious metal alloy member consisting essentially of a silver alloy, which has a silver Ag content of not less than 99.45 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 5,000 ppm.

37. A hard precious metal alloy member consisting essentially of a silver alloy, which has a silver Ag content of not less than 99.45 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 5,000 ppm in total.

38. The hard precious metal alloy member according to claim 36, wherein the member consists essentially of a cast alloy, and has a hardness of not less than 120 Hv, and a Young's modulus of not less than 7,000 kg/mm².

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39. The hard precious metal alloy member according to claim 36, wherein the member consists essentially of a worked alloy at a working rate of not less than 50%, and has a hardness of not less than 140 Hv, and a Young's modulus of 7,000 kg/mm².

40. The hard precious metal alloy member according to claim 37, wherein Ca is selected from the alkaline-earth elements.

41. A hard precious metal alloy member consisting essentially of a cast gold alloy, which has a gold Au content of not less than 98.5 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm, wherein the member has a hardness of not less than 130 Hv, and a Young's modulus of 5,000 kg/mm².

42. A hard precious metal alloy member consisting essentially of a cast gold alloy according to claim 41, which has a gold Au content of not less than 98.5 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total, wherein the member has a hardness of not less than 130 Hv, and a Young's modulus of 5,000 kg/mm².

43. A hard precious metal alloy member consisting essentially of a worked gold alloy at a working rate of not less than 50%, which has a gold Au content of not less than 98.5 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm, wherein the member has a hardness of not less than 150 Hv, and a Young's modulus of 5,000 kg/mm².

44. A hard precious metal alloy member according to claim 43, consisting essentially of a cast gold alloy at a working rate of not less than 50%, which has a gold Au content of not less than 98.5 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total, wherein the member has a hardness of not less than 150 Hv, and a Young's modulus of 5,000 kg/mm².

45. A method of manufacturing a hard precious metal alloy member, comprising the steps of:

casting a material consisting essentially of a gold alloy, which has a gold Au content of from 37.50 to 98.45 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm;

subjecting the material to a solution heat treatment;

and

subjecting the material to an aging treatment after the solution heat treatment.

46. A method of manufacturing a hard precious metal alloy member, comprising the steps of:

casting a material consisting essentially of a gold alloy, which has a gold Au content of from 37.50 to 98.45 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm;

subjecting the material to a solution heat treatment;

working the material into a predetermined shape; and

subjecting the material to an aging treatment before or after the working.

47. A method of manufacturing a hard precious metal alloy member according to claim 45, comprising the steps of:

casting a material consisting essentially of a gold alloy, which has a gold Au content of from 37.50 to 98.45 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements; silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total;

subjecting the material to a solution heat treatment;

and

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subjecting the material to an aging treatment after the solution heat treatment.

48. A method of manufacturing a hard precious metal alloy member according to claim 46, comprising the steps of:

casting a material consisting essentially of a gold alloy, which has a gold Au content of from 37.50 to 98.45 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total;

subjecting the material to a solution heat treatment;
working the material into a predetermined shape; and
subjecting the material to an aging treatment before or after the working.

49. A method of manufacturing a hard precious metal alloy member, comprising the steps of:

casting a material consisting essentially of a platinum alloy, which has a platinum Pt content of not less than 85.0 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm;

subjecting the material to a solution heat treatment;
and

subjecting the material to an aging treatment after the

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solution heat treatment.

50. A method of manufacturing a hard precious metal alloy member, comprising the steps of:

casting a material consisting essentially of a platinum alloy, which has a platinum Pt content of not less than 85.0 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm;

subjecting the material to a solution heat treatment;

working the material into a predetermined shape; and

subjecting the material to an aging treatment before or after the working.

51. A method of manufacturing a hard precious metal alloy member according to claim 49, comprising the steps of:

casting a material consisting essentially of a platinum alloy, which has a platinum Pt content of not less than 85.0 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total;

subjecting the material to a solution heat treatment;

and

subjecting the material to an aging treatment after the solution heat treatment.

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52. A method of manufacturing a hard precious metal alloy member according to claim 50, comprising the steps of:

casting a material consisting essentially of a platinum alloy, which has a platinum Pt content of not less than 85.0 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total;

subjecting the material to a solution heat treatment;

working the material into a predetermined shape; and

subjecting the material to an aging treatment before or after the working.

53. A method of manufacturing a hard precious metal alloy member, comprising the steps of:

casting a material consisting essentially of a silver alloy, which has a silver Ag content of not less than 80.0 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm;

subjecting the material to a solution heat treatment;

and

subjecting the material to an aging treatment after the solution heat treatment.

54. A method of manufacturing a hard precious metal alloy

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casting a material consisting essentially of a silver alloy, which has a silver Ag content of not less than 80.0 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm;

55. A method of manufacturing a hard precious metal alloy member according to claim 53, comprising the steps of:

subjecting the material to a solution heat treatment;

and

56. A method of manufacturing a hard precious metal alloy member according to claim 54, comprising the steps of:

casting a material consisting essentially of a silver alloy, which has a silver Ag content of not less than 80.0 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total;

subjecting the material to a solution heat treatment;

working the material into a predetermined shape; and

subjecting the material to an aging treatment before or after the working.

57. A method of manufacturing a hard precious metal alloy member, comprising the steps of:

casting a material formed of a precious metal alloy, which consists essentially of two or more elements selected from the precious metal element group consisting of gold Au, silver Ag, platinum Pt, palladium Pd, rhodium Rh, ruthenium Ru, and osmium Os, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm;

subjecting the material to a solution heat treatment;

and

subjecting the material to an aging treatment after the solution heat treatment.

58. A method of manufacturing a hard precious metal alloy

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member, comprising the steps of:

casting a material formed of a precious metal alloy, which consists essentially of two or more elements selected from the precious metal element group consisting of gold Au, silver Ag, platinum Pt, palladium Pd, rhodium Rh, ruthenium Ru, and osmium Os, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm;

subjecting the material to a solution heat treatment;

working the material into a predetermined shape; and

subjecting the material to an aging treatment before or after the working.

59. A method of manufacturing a hard precious metal alloy member according to claim 57, comprising the steps of:

casting a material formed of a precious metal alloy, which consists essentially of two or more elements selected from the precious metal element group consisting of gold Au, silver Ag, platinum Pt, palladium Pd, rhodium Rh, ruthenium Ru, and osmium Os, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total;

subjecting the material to a solution heat treatment;

and

subjecting the material to an aging treatment after the

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solution heat treatment.

60. A method of manufacturing a hard precious metal alloy member according to claim 58, comprising the steps of:

casting a material formed of a precious metal alloy, which consists essentially of two or more elements selected from the precious metal element group consisting of gold Au, silver Ag, platinum Pt, palladium Pd, rhodium Rh, ruthenium Ru, and osmium Os, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in total;

subjecting the material to a solution heat treatment;

working the material into a predetermined shape; and

subjecting the material to an aging treatment before or after the working.

61. A method of manufacturing a hard precious metal alloy member, comprising the steps of:

casting a material formed of a precious metal alloy, which consists essentially of at least one element selected from the group consisting of gold Au, silver Ag, platinum Pt, palladium Pd, rhodium Rh, ruthenium Ru, and osmium Os, and at least one element selected from the group consisting of copper Cu, nickel Ni, aluminum Al, zinc Zn, and Fe, and contains

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gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm;

subjecting the material to a solution heat treatment;
and

subjecting the material to an aging treatment after the solution heat treatment.

62. A method of manufacturing a hard precious metal alloy member, comprising the steps of:

casting a material formed of a precious metal alloy, which consists essentially of at least one element selected from the group consisting of gold Au, silver Ag, platinum Pt, palladium Pd, rhodium Rh, ruthenium Ru, and osmium Os, and at least one element selected from the group consisting of copper Cu, nickel Ni, aluminum Al, zinc Zn, and Fe, and contains gadolinium Gd in a range of not less than 50 ppm but less than 15,000 ppm;

subjecting the material to a solution heat treatment;
working the material into a predetermined shape; and
subjecting the material to an aging treatment before or after the working.

63. A method of manufacturing a hard precious metal alloy member according to claim 61, comprising the steps of:

casting a material formed of a precious metal alloy, which consists essentially of at least one element selected

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subjecting the material to a solution heat treatment;
and

64. A method of manufacturing a hard precious metal alloy member according to claim 62, comprising the steps of:

casting a material formed of a precious metal alloy, which consists essentially of at least one element selected from the group consisting of gold Au, silver Ag, platinum Pt, palladium Pd, rhodium Rh; ruthenium Ru, and osmium Os, and at least one element selected from the group consisting of copper Cu, nickel Ni, aluminum Al, zinc Zn, and Fe, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 15,000 ppm in

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subjecting the material to a solution heat treatment;
working the material into a predetermined shape; and
subjecting the material to an aging treatment before or

subjecting the material to an aging treatment after the solution heat treatment.

subjecting the material to a solution heat treatment;

working the material into a predetermined shape; and
subjecting the material to an aging treatment before or
after the working.

69. A method of manufacturing a hard precious metal alloy
member, comprising the steps of:

casting a material consisting essentially of a palladium
alloy, which has a palladium Pd content of not less than
99.45 wt%, and contains gadolinium Gd in a range of not less
than 50 ppm but less than 5,000 ppm;

subjecting the material to a solution heat treatment;
and

subjecting the material to an aging treatment after the
solution heat treatment.

70. A method of manufacturing a hard precious metal alloy
member, comprising the steps of:

casting a material consisting essentially of a palladium
alloy, which has a palladium Pd content of not less than
99.45 wt%, and contains gadolinium Gd in a range of not less
than 50 ppm but less than 5,000 ppm;

subjecting the material to a solution heat treatment;

working the material into a predetermined shape; and

subjecting the material to an aging treatment before or
after the working.

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71. A method of manufacturing a hard precious metal alloy member according to claim 69, comprising the steps of:

casting a material consisting essentially of a palladium alloy, which has a palladium Pd content of not less than 99.45 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 5,000 ppm in total;

subjecting the material to a solution heat treatment;
and

subjecting the material to an aging treatment after the solution heat treatment.

72. A method of manufacturing a hard precious metal alloy member according to claim 70, comprising the steps of:

casting a material consisting essentially of a palladium alloy, which has a palladium Pd content of not less than 99.45 wt%, and contains gadolinium Gd and at least one element selected from the group consisting of rare-earth elements other than Gd, alkaline-earth elements, silicon Si, aluminum Al, and boron B, in a range of not less than 50 ppm but less than 5,000 ppm in total;

subjecting the material to a solution heat treatment;
working the material into a predetermined shape; and
subjecting the material to an aging treatment before or

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after the working.

73. A method of manufacturing a hard precious metal alloy member, comprising the steps of:

casting a material consisting essentially of a silver alloy, which has a silver Ag content of not less than 99.45 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 5,000 ppm;

subjecting the material to a solution heat treatment;
and

subjecting the material to an aging treatment after the solution heat treatment.

74. A method of manufacturing a hard precious metal alloy member; comprising the steps of:

casting a material consisting essentially of a silver alloy, which has a silver Ag content of not less than 99.45 wt%, and contains gadolinium Gd in a range of not less than 50 ppm but less than 5,000 ppm;

subjecting the material to a solution heat treatment;
working the material into a predetermined shape; and
subjecting the material to an aging treatment before or after the working.

75. A method of manufacturing a hard precious metal alloy member according to claim 73, comprising the steps of:

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subjecting the material to an aging treatment after the solution heat treatment.

subjecting the material to an aging treatment before or after the working.